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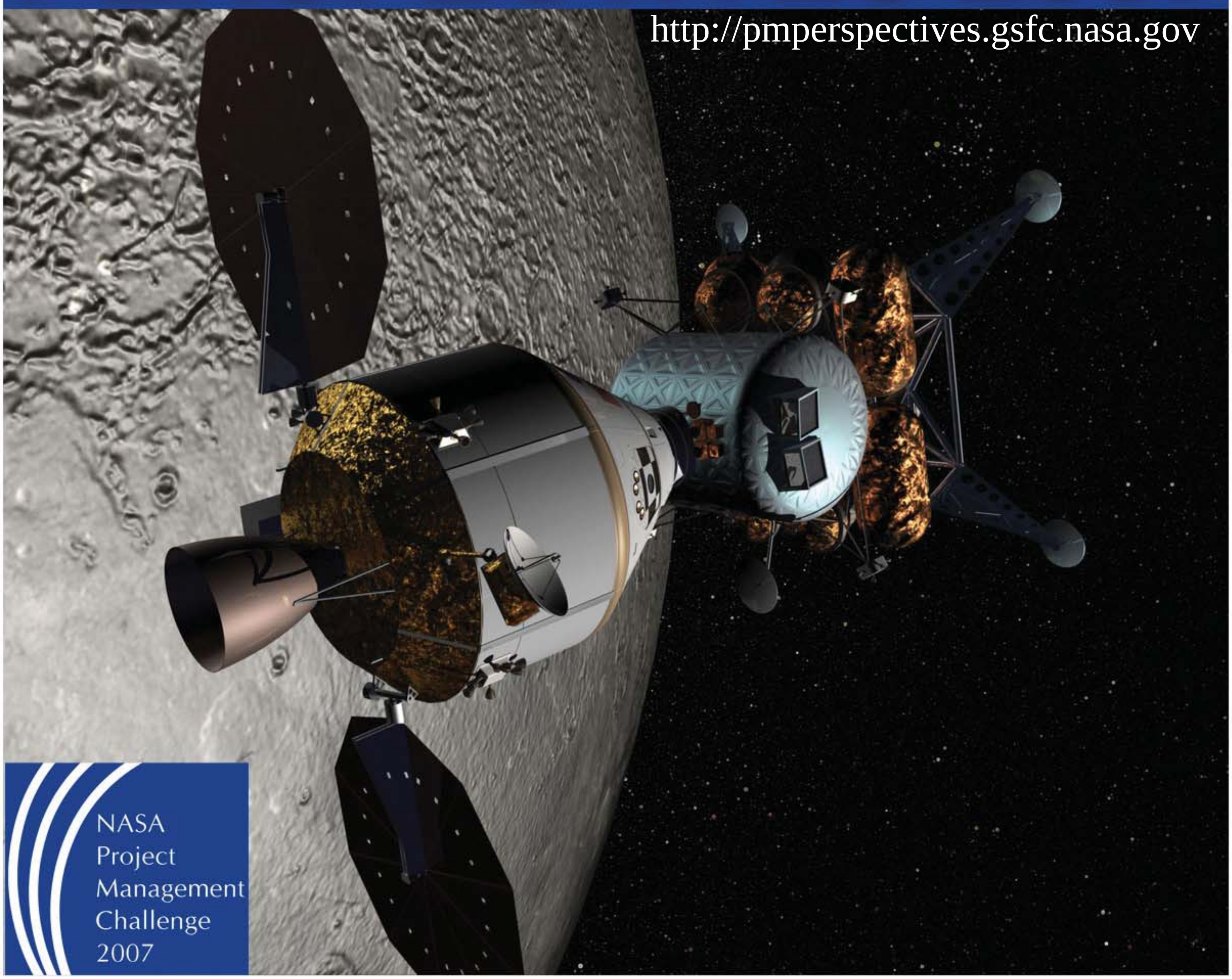

NASA Project Management Challenge 2007

April 2007

From the PM Challenge Co-Chairs:

We hope you enjoyed NASA PM Challenge 2007 in Galveston. As you may recall, students and faculty from Houston area colleges and universities attended the conference. The student volunteers not only gained a unique insight into project management at NASA, but have now put that insight into action with their impressions of PM Challenge 2007 through a collection of thoughtful articles and essays contained in this edition of PM Perspectives. All of the PM Challenge 2007 presentations can be found at: http://pmchallenge.gsfc.nasa.gov/presentations2007.htm

We would like to say a special thank you to Greg Wright, Jennifer Poston, Echele Thomas and Judy Rumerman for their creative efforts in making this edition of PM Perspectives possible.

Enjoy reading this issue of PM Perspectives, and pass it along to your colleagues.

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Shuttle-Mir Program

Speaker Frank Culbertson, Jr.
Written by Reese Kimmons

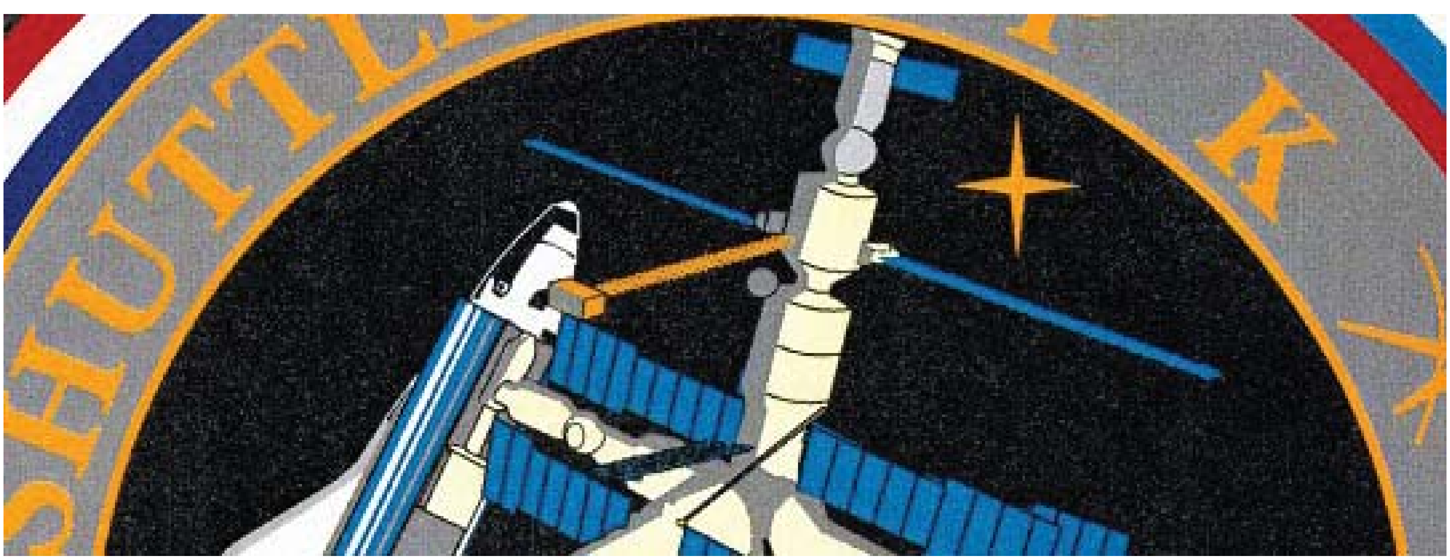
Designed to give Russian and American teams the opportunity to work together during long-duration space missions, the Shuttle-Mir program was actually Phase 1 of today's International Space Station program. The Russian Mir space station was placed in orbit in 1986. Beginning in 1995, U. S. astronauts moved into the station, sharing it with their cosmonaut counterparts. Frank Culbertson, Jr., was named deputy program manager of Shuttle-Mir in 1994 and became program manager in 1995.
According to him, many lessons valid today were learned from Shuttle-Mir, a program that presented problems and challenges never before faced in the history of human spaceflight.

The program officially began in 1994 with Space Shuttle flight STS-60, marking the first time a cosmonaut had flown aboard a Shuttle. Construction of Mir had not yet been completed at that time. The first astronaut became a resident of the station in 1995. According to Mr. Culbertson, Mir had not been well maintained.

The program proceeded well until 1997 when Mr. Culbertson and his team faced their most challenging year. A series of incidents occurred including the most severe fire ever aboard an orbiting spacecraft and failures of systems for oxygen generation, carbon dioxide scrubbing, cooling, communication antenna tracking, and waste collection and processing. During a subsequent manual docking system test, Mir collided with a cargo resupply ship, causing loss of station electrical power and attitude control, which resulted in the station slowly and uncontrollably tumbling through space until repairs could be made. In his presentation, Mr. Culbertson recalled the intense media and congressional scrutiny following the very visible problems of 1997. Questions were raised as to whether the program should continue.

Despite the challenges, all the goals of the Shuttle-Mir program were accomplished, including all U. S. scientific experiments. The added congressional and media pressure, combined with internal and external reviews, resulted in a stronger, safer system. Mr. Culbertson said Shuttle-Mir taught them to be both flexible and disciplined and to take nothing for granted. A number of technical lessons were learned as well. He encouraged project managers currently involved with the International Space Station to pay attention to the lessons learned from Shuttle-Mir.

Seven astronauts spent a total of 30 months aboard Mir. The program required 11 Shuttle flights, nine of which docked with the station. Mir flew until it was de-orbited in 2000, falling into the ocean. The word "mir" can mean place, world, or community in Russian. To Mr. Culbertson, mir has come to mean community.



The NASA Game Plan

Speaker Rex Geveden
Written by Reese Kimmons

NASA is regaining credibility that had been lost as a result of mission failures and cost overruns during the past two decades, says NASA's Associate Administrator Rex Geveden. In his keynote address at this year's Project Management Challenge, Mr. Geveden credits the creation of a culture of mission success, mission focus, and accountability to the implementation of a game plan with three primary elements—organizational governance, institutional management, and portfolio management.

To increase organizational governance efficiency, NASA has adopted a "separation of powers" philosophy. Mr. Geveden believes that creating separate institutional and programmatic chains of command has created what he referred to as "a natural chain of accountability," allowing more problems to be resolved at lower levels. The command chains come together at the associate administrator level. Issues that make it up the line to the associate administrator's desk without resolution are, according to Mr. Geveden, the "meaty" ones that need to be there.

When managing its portfolio, NASA administration considers domestic and foreign policies as well as civil views toward space exploration. Mr. Geveden believes it is necessary to recognize the emergence of space-related technologies in other nations and to make efforts to partner with those nations. While NASA is not responsible for national security, he feels that partnering with other nations in space exploration contributes significantly to it—more partners, fewer potential enemies. He is also supportive of private space entrepreneurship, noting that advances made in the private sector benefit the agency and the nation.

According to Mr. Geveden, NASA is doing well programmatically. The game plan is working. He readily admits that the agency has a long way to go before it fully regains lost credibility, but said that it is working hard to build on the fragile confidence that has resulted from a series of successful missions. Mr. Geveden says that NASA is "going back to being the thought leader in aeronautics." He stressed the importance of focusing on the mission at hand and seemed committed to improving the agency's institutional health through lean and efficient governance. He reminded us that we shouldn't let the stress of our daily lives overwhelm us and prevent us from achieving our goals. Based on the number of speakers who referred back to Rex Geveden's statements during the rest of the conference, his keynote address was well received.

Precise Writing: To Get Results, Ensure Accuracy and Clarity

Speaker Lin Kroeger
Written by Hannah Lange

How many times have you read a government or legal document and wondered what they were talking about? We have a tendency to use large words and long sentences to impress people and sound knowledgeable when writing, especially in a work environment, said Lin Kroeger of PWD Consulting Inc., at NASA PM Challenge 2007. It is much better to convey information clearly, precisely, and comprehensively because clarity produces action. In addition, accuracy is necessary to prevent misunderstanding and mistakes.

We need to write clearly and accurately whether it is a simple two-sentence e-mail, project management report, or program guideline. Any written communication must have a message, context, and roadmap. Limit the "roadmap" to no more than five main points because people have short attention spans. If there are more than five points, use subheadings to convey the context and additional details.

Don't rush when writing! Before starting your message, the key is to FIRST sit down and think about how to answer "K-T-D" in one sentence: "What should my reader Know – Think – and Do?" Then choose your words carefully. To convey exact meaning, use precise and familiar words.

Specifically, verbs are extremely important. Verbs should be visual, intense, and action-oriented. There should be approximately one verb per every 10 words. Verbs should be used up-front in each sentence, not hidden. Use active verbs instead of passive ones.

Another useful suggestion from Ms. Kroeger: Do not use parentheses as they cause a visual stop for the reader. Start a new sentence instead to keep the flow of thought moving. Finally, do not use complex vocabulary or "buzzwords" as the reader might not know their meaning or correct usage.

To summarize, you must determine what you want your readers to know, think, and do, then convey the message using precise and familiar words. In order to get successful results, clarity matters in every written communication.

From ESAS to Ares - A Chronology

Speaker Steve Cook
Written by A. Frank Thomas

At NASA PM Challenge 2007, Steve Cook presented "From ESAS to Ares: A Chronology." Mr. Cook is the director of the Exploration Launch Projects Office at NASA's Marshall Space Flight Center. This presentation described the selection process of the Ares launch vehicle family, which began with NASA's Exploration Systems Architecture Study (ESAS) in 2005. ESAS examined the top-level requirements for the proposed crew and cargo launch systems, which would include the ability to assume the Space Shuttle's role of supporting the International Space Station and to support further exploration missions to the Moon and Mars in different configurations.

The design for Ares included both a Crew Exploration Vehicle and Cargo Launch Vehicle. Among the top contenders for each category were several different shuttle-derived designs, a human-rated version of the Delta IV expendable launch vehicle (ELV), and several variants of the Atlas ELV. In the crew launch comparison, the Shuttle-derived designs came out ahead in both safety and average cost per flight, and measuring about average with respect to payload capacity. When comparing the options for a combined cargo and crew launch family, the current Ares I-Ares V system measured higher in overall payload capacity as well as in crew safety.

The conclusion of the study was to pursue a 25-metric ton (55,116-pound) payload, Shuttle-derived crew launch vehicle. This vehicle, now known as the Ares I, is the "safest, most reliable, and most affordable" solution, according to ESAS. This system, using a solid rocket booster (SRB) and a Shuttle-derived liquid fuel tank for the upper stage, will take advantage of almost all previously existing Shuttle facilities. It also uses a number of systems already rated for human spaceflight, saving further development costs. The 125 metric ton (275,578-pound) payload Ares V also uses SRBs and a fuel tank derived from the external tank of the Space Shuttle. It is slated for further development during the time the Ares I enters service in the next few years. In the future, it will also include an Earth departure stage allowing cargo to be carried to the Moon.

After the ESAS presented its recommendations, further changes were made in the Ares system to streamline the development and focus more on exploration than International Space Station maintenance. Focusing on reaching exploration goals sooner, the decision was made to use the Apollo-heritage J-2X engine as the common upper stage for both launch vehicles. This would allow for work done on the Ares I to help more directly with Ares V development. In addition, the Ares I would use a five-segment SRB instead of one with four segments. Finally, the commercially developed RS-68 would replace the Space Shuttle main engine as the Ares V first stage. This would save billions of dollars over the lifetime of the program. The usage of already-developed technology and shared components between vehicles reduces cost dramatically and brings closer the goal of exploration beyond low-Earth orbit.

Spaceflight Project Security

Speakers Randy Seftas and Josh Krage
Written by Megan Oldag

The presentation given by Randy Seftas and Joshua Krage from NASA Goddard Space Flight Center exposed me to issues and weaknesses that I didn't think NASA could ever have. I have always been fascinated with the stars and with space, and through the eyes of a child the longing to escape to another world is seemingly simple. Mr. Krage mentioned "the Holy Grail effect," the term used to illustrate the feelings of the public toward NASA in the early Space Age. There was a strong feeling of national pride; everyone wanted NASA to succeed. He also mentioned its lesser effect. Now, there is no mysticism about going into space; the information that once only a few had access to is now at the world's fingertips. I think that I am still stuck in that Holy Grail mentality; I have a reverence for NASA and its contributions to the scientific and technological fields.

NASA's spaceflight systems face many different challenges. Two of these were thoroughly discussed and elaborated on in the presentation. The first challenge is natural and external, an unintentional collision between a satellite and another object. The second is manmade, internal and intentional.

Launching a satellite into space is a precise art; many different variables need to be taken into consideration. Having the time, location, and trajectory in synch with existing satellite orbits is difficult but is possible. There are mathematical equations connecting all the elements involved with the ready-to-launch satellite. The location of the launch is known, the time of launch can be determined by knowing the launch location and the speed at which the Earth is turning, the satellites orbiting the Earth are all accounted for, and their orbits are predictable. However, satellites are not the only objects orbiting our Earth. We humans have created another variable: it is undocumented, its orbit uncharted, and it puts billions of dollars at risk. It is orbital debris.

U.S. National Space Policy, signed by President George Bush on August 31, 2006, outlines the detrimental effect of orbital debris: "Orbital debris poses a risk to continued reliable use of space-based services and operations and to the safety of persons and property in space and on Earth."

Goddard Space Flight Center has taken the National Space Policy a step further to create Goddard's Space Asset Protection Plan with the goal to "protect space assets from intentional or unintentional disruption, exploitation or attack, whether natural or man-made." The center's objective, as described by Mr. Seftas, is to "mitigate or eliminate vulnerabilities and single points-of-failure in the infrastructure of space system." Mr. Seftas also stated that the center will provide "space asset functional support" to all missions and management. This functional support will include, at a minimum, "support in the development of threat assessments, identification of risks, and identification of protection strategies appropriate for the threats and risk levels identified," with the desired result being a system with fewer points of weakness and a greater ability to defend against technological attacks and infiltration.

We need to remember that there are many different avenues for technological attack and even though a system can defend against or counteract a threat, the system may still be vulnerable to ill-intended technology. The probability is very high that an attacker would use a "cyber attack" on a system. This high probability also makes cyber attacks the most serious technological threat we are seeing today. These attacks are especially dangerous to NASA spaceflight systems because computer programs and viruses are constantly evolving and becoming more sophisticated, thus making spaceflight systems more vulnerable. Mr. Seftas used the example of the Hubble Telescope. When it was launched in 1990, its computer system was already 30 years old, being built in 1970. Hubble had to be updated with a more modern computer. So NASA's astronauts replaced the existing system with one from 1983. Keep in mind that Hubble was launched in 1990 and then updated with 1983 technology. There is a saying that "the better the security, the better the criminal." Not so in this case—the criminal had roughly 20 years to update and fine tune viruses and computer programs meant to harm spaceflight systems. So although NASA technology and countermeasures far surpassed an attacker's threats years ago, the criminals are catching up. Mr. Krage was able to bring this phenomenon to life and truly show the severity of inadequate security. In several studies created to test the "survivability" of unprotected systems, it was found that "the average time is currently measured in minutes and continues to diminish....Attacks are so cheap and easy to launch, they have become omnipresent and impossible to avoid," according to Mr. Krage. Even with this information known, and the need for change and improvement apparent, it is very difficult for NASA to keep their systems up-to-date. As Mr. Krage put it, "NASA is being asked to do more with less." It is very expensive even for ground systems to be updated. There is just not enough money to update constantly, and there are not as many employees as there once were.

An attacker does not have to be an expert to pose a threat to spaceflight systems. The information needed can be easily located on the internet. The vast majority of hackers are unskilled, low-level attackers. Most of these people are teenagers getting into trouble just looking for "fun." They are usually easy to track and easy to catch. Here we see the "Holy Grail effect" in complete retrograde.

The second level of hacker is the semiskilled attacker. These people have more motivation, usually money, and more tools to complete their tasks. At the unskilled level, some of the hackers have said that they did not even realize what they were doing. At the semiskilled level, we see more purposeful attacks, usually by organized crime trying to expand their "reach."

The third level of hacker is more dangerous and harder to catch. This is the skilled attacker, usually associated with industrial espionage. In this case, there is also motivation, but NASA has something that the hacker wants, such as a certain program or classified information.

The most dangerous hacker is the highly skilled hacker, who usually is guilty of national or state espionage. These hackers are very advanced in their computer skills, have a vast amount of resources, and are very difficult to track, let alone catch. These four types of people are what NASA is constantly up against. As they are moving forward, NASA spaceflight technology remains stagnant.

There is no way to tell what this evolution of technology is going to create next, but there are trends and a direction in which NASA is heading. Mr. Krage described the projection as "cyber trends." He says that the "financial motivation continues to improve." The United States is technology-dependent, we cannot live without it; and the rest of the world knows this. "More and more nations are beginning to incorporate information warfare capabilities into their military structure." Changes need to be made or NASA will continue to remain stationary in the technological world. Mr. Krage described some countermeasures that need to be followed: "Systems need to improve and evolve across the board…. Systems require active responses within the infrastructure." This means there needs to be a detailed understanding of the system and how it works and more importantly, what can break and lead to a breach. Mr. Krage also said that "paranoia regarding deliberate man-made actions, both internal and external" is required. He said that more focus needs to be on what can be made to go wrong rather than only focusing on what could go wrong.

Spaceflight protection is becoming increasingly difficult and will continue to become more difficult. The data that is needed from satellites and our nation's dependency on this information are not going to erode with time. Accessibility to information and foreign knowledge of U.S. space systems increase our country's vulnerability to terrorist attacks on systems. Mr. Seftas responded to a question at the end of the presentation regarding the direction in which NASA is heading. He replied that "the trends are going in the wrong direction….It is no longer a matter of if something is going to happen, it is when. We need to prepare now for the 'when.'"

The Effects of Humor on Project Management

Speaker Marco Sampietro
Written by Prof. J.B. Groves III

When I think of humor, my mind goes back to my youth growing up watching the team of the Three Stooges and their comedic antics. It was during this time as a young boy that I also witnessed the wonderment and serious business of human spaceflight with the Mercury and Gemini missions. You may be asking yourself at this point—how are these two things related? Thanks to NASA's Project Management Challenge 2007 and the "Effects of Humor on Project Management" session, I discovered that, given the circumstances, the environments we both live and work in deserve a degree of humor.

The presentation given by Marco Sampietro, professor at the SDA Bocconi School of Management in Milan, Italy, on "The Effects of Humor on Project Management" made me think about how humorous conversation and interaction seem to bond individuals together. Professor Sampietro's session started by the defining humor from the Longman Dictionary of English Language and Culture- "Humor can be defined as a state of mind, as the quality of causing amusement, and as the ability to understand and enjoy what is funny and makes people laugh."

The first segment of Professor Sampietro's session pointed out that there has been very little research into humor—its implications and use in projects and its effect on project team success. His proposed framework of "Project Success and Humor" divide the skills one brings to the project into hard skills and soft skills. The hard skills are "methodologies, procedures, and tools." Hard skills must be learned and then applied, according to Professor Sampietro. "The soft skills are "communication, team management, leadership, conflict management, problem solving and decision making, stress management, motivation, and negotiation."

The second segment of Professor Sampietro's session discussed the effects of using humor in each of the hard and soft skills categories. He stressed that there are situations in which humor may have positive and/or negative effects on the project team. Therefore, a project leader has to judge when it is appropriate to use humor. The following are Professor Sampietro's examples from his research in each of the soft skill areas related to the framework.

Communication: People pay more attention to speakers who use a humorous style, that is, "humor improves the persuasiveness of the communication."

Team Management: Team Building Phase: Humor is a non-invasive way to test relations; it gives people who use it a parachute in case of bad responses; "humor represents a shared interpretation of events that highlights similarities among team members and creates a sense of equality."

Team Management: Detecting the Team Morale: "The spontaneous use of humor is not always an indicator of personal or organizational well being."

Leadership: A study has shown that the use of humor by leaders relates positively to individual and unit performance: "leaders that are humor initiators have a task-oriented leadership style and leaders that are humor appreciators have a relationship-oriented style."

Conflict Management: Humor can be a strategy in managing conflict if used properly for the situation, according to Professor Sampietro, "thus permitting people to deal with a broader set of alternatives." "The coping functions of humor permit us to lower the emotional involvement related to a situation and to change the dominant cognitive perspective." Humor may also be used to avoid confrontational situations. "Humor, mostly in the form of metaphors, shows the situation under different perspectives," helping to "smooth" a tense situation. It can be used to play down differences and attempt to create a common ground. It may be used to negotiate a compromise in a given situation. "Humor can be used to convey ambiguous messages to express ideas that, if communicated directly, would offend others." Humor can communicate a sense of urgency or anger. "Humor can express hostility and aggressiveness. Embedding aggressive messages in a humorous form is perceived as less risky for the sender and less hostile for the receiver but leaves intact the meaning." However "not permitting conflicts to come to light can be dangerous; it has been shown that humor does not hide or suppress conflicts."

Negotiation: Humor increases the likeability of a communicator and liked communicators have more influence and power: “humor lowers the perceived importance of the object of the negotiation, thus leading to greater concessions…Humor can play a double role, depending on the part one takes.”

Motivation: Humor can influence a sense of hope. “Humor leads to a greater sense of self-efficacy in dealing with specific problems or stressful events. Humor works on both agency and pathways dimensions, producing an increase in motivation.”

Problem Solving and Decision-Making: External humorous stimuli can positively affect problem solving and creativity. “Humor lowers tension and improves divergent thinking.” In decision-making, humor can reveal a negative effect related to the perception of risk. It tends to lower the importance of the discussed topic, thus, risky activities can be underestimated. The effect on hope and motivation may also play a negative role in these situations.”

Stress Management: Humor, especially demonstrated by laughing, helps reduce the negative effects of stress. “Humor has also a positive effect on difficult situations because it produces a cognitive shift that shows [the situations] as less stressful and emotional. However, this can be dangerous when the situation may cause risk.”

Each member of the project team brings his or her own professional discipline to a team. Hard skills must be learned and then applied, says Professor Sampietro. The relationship of integrating humor and learning hard skills can be gleaned from the “Project Success and Humor” framework. “Incorporating humor in lecture materials improves listeners/readers’ attention, their ability to connect concepts and find inconsistencies, and information retention. Humor is strongly preferable in self-education activities. Adding humor to the training environment and application of hard skills can benefit the team. The focus shifts from the specific methodology to the way humor is used. Using a funny or humorous approach is important during the introduction of new methodologies.”

Other considerations relating to using the framework as a guide were also discussed. Professor Sampietro did caution his audience that “humor does not always have positive meanings and positive effects, so trying to detect criticalities lying behind humor is a non-trivial activity.” Finally, “standardizing the use of humor can be counterproductive; it is better to promote a positive climate that produces spontaneous humor. Canned humor can be used, but the risk of being unnatural could be high.”

In conclusion, Professor Sampietro’s research, concepts, and focus on humor as a management tool were fascinating. His proposed framework of “Project Success and Humor” can be used to influence project team members’ behavior and thus project outcomes.

Managing External Relations

Speaker Daniel Dumbacher
Written by James K. Daniels

Daniel Dumbacher, deputy director of the Exploration Launch Project Office at NASA Marshall Space Flight Center, presented an interesting talk on "Managing External Relations." at NASA PM Challenge 2007. Mr. Dumbacher previously served as chief engineer and program manager of the DC-XA project, deputy manager of the X-33 project, and manager and deputy manager on the Space Launch Initiative/2nd Generation Reusable Launch Vehicle project.

Mr. Dumbacher was clear in his message regarding the relationships that surround every successful project. Many people think that external relations are the relations only between the government and outside vendors. There are, however, other relations considered external to the members of a project team. He spoke of the relationships that are created between NASA and the "customers." Among the customers he listed were NASA team members, astronauts, the NASA centers and Headquarters, Congress, the media, professional organizations, advocacy groups, and the public. Mr. Dumbacher said, "To ensure good relations, you must establish trust, integrity, and a free flow of information."

Two projects in NASA's past were ground breaking in regard to handling external relationships—the DC-XA and the X-33 flight demonstrator. During these projects, it became clear that communication had to become a priority. The lack of open lines of communication crippled the prospects of the projects, Mr. Dumbacher said. NASA soon learned that the lack of the involved communities exchanging ideas and information could lead to a fatal outcome for the project.

Mr. Dumbacher conveyed his ideas of a project succeeding with open communication. A successful project would:

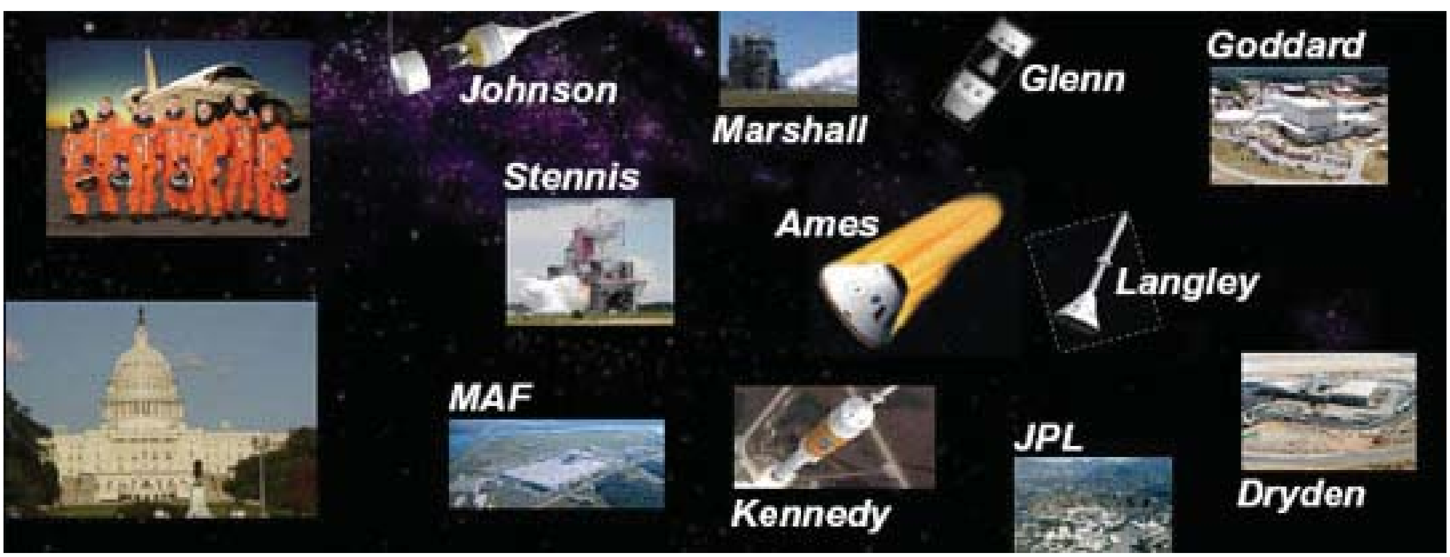
• Define and manage requirements.
• Add value to create traction and momentum.
• Reduce technical and programmatic risk.
• Keep resources flowing.
• Promote mission success.
• Always do the right thing and make sure to communicate with customers.
• Understand where to be flexible.

"Communication and team work are key components to the success of any team," said Mr. Dumbacher. He went on to say, "The relationships within the team can be some of the most important of all the relationships a team will form." Always keep in mind that the team you are working with is an extension of your family and therefore should be considered as such. When managing a team you must always remember that your team looks to you for leadership and to answer the difficult questions it faces. The project manager must establish a free flow of information among his team members. It is important to remember that everyone has ideas, good or bad, and ignoring a team member's ideas could cost the entire team time and expense. Mr. Dumbacher said, "People get the jobs done, not their computers, so consider everything your people have to say." As a team leader, you must also know how to read people and that means more than listening to their words but also interpreting their body language. If a problem arises on a project and you notice a team member upset or tense on a certain subject yet they don't bring their concerns to the foreground, then as project manager, you should approach that person on the issue to hear his/her concerns. In some cases, the team member might be shy or afraid of speaking out due to their thoughts of ridicule from team members. When listening to your team, Mr. Dumbacher said, "Don't concentrate on just the words but rather see the concepts behind the ideas and opinions."

The relationships outside of the team are just as important to the success of the project. The free flow of communication and information needs to be apparent and assured to all involved with the project and is essential to the support of the team and the project. The public is one of the most critical of all relationships your team may face. The media can be the worst enemy and the best friend of any team and, in turn, sway the public to favor or to detest the actions of the team or the entity in which the project is located. Winning over the public can make a project. On the other hand, upsetting the public can destroy a project before it begins. Winning over the public can result in winning over Congress, and winning over Congress is winning the funding required to proceed with the project.

The relationship between the team and the astronauts is of the utmost importance. Winning the confidence of the astronauts is a major role of all project managers and their team members. The exchange of information is crucial in the success of a project, and communication between the two must be in excellent form. The astronaut must feel total and complete confidence in the work performed by the team and the leadership skills of the project manager.

Mr. Dumbacher stressed that open communication is the key to excellent external relations. Be open, honest, and willing to listen to each individual involved in the project, even those that may not seem to be directly involved. Handling all the responsibilities of a project manager is a full-time job. Without well-organized and well-established relations, a project can fall apart in the blink of an eye.



Reflection on the NASA Project Management Challenge 2007

Written by Sarah Percy Janes, PhD

For two days, I had the opportunity to visit with and listen to NASA managers from various projects/programs speak on various facets of project management. As Dean of Instruction at a community college, I can transfer the issues and lessons learned to similar situations at the college.

The integration of project management with knowledge management with risk management serves as a model of what the culture of every organization should be. Encouraging an environment that is open to discussion and acknowledging of mishaps is the first step in developing that culture. From there, an organization can freely explore opportunities for change based on Pause and Learn (PAL) processes that lead to lessons learned. All too often, organizations do not take the time to reflect and see what knowledge can be transferred to other parts of an organization or other projects even when doing so may save time later. Communities of Practice (CoPs) further develop the open environment so that managers and other team players can plan for risks, and perhaps, reduce mishaps or close calls.

It was inspiring to hear leaders of the space community openly discuss mistakes that had been made. It was equally inspiring to hear these same leaders talk about lessons they had learned and how these lessons were used to prevent similar mishaps. These open discussions were proof of the culture of openness that actually exists at NASA and with their industry partners.

The concern over the number of databases at NASA was interesting. Determining how to minimize the number of different databases was certainly a topic to which I can relate. At San Jacinto College District, we are taking a close look at our data resources, the varying platforms, and the lack of interaction between these data resources. I am interested in how NASA will address this situation and find ways to lessen the overlap of data-gathering in various areas.

Thank you for providing such a beneficial opportunity.

Design for Operations: Space Shuttle vs. Sea Launch

Speaker Bo Bejmuk
Written by A. Frank Thomas

At the 2007 NASA Project Management Challenge, Bo Bejmuk, formerly of the Boeing Company, presented a comparison of the Space Shuttle and the Sea Launch system from an operational design perspective. The presentation compared the differences in operational design for these two systems and explored the effects that design requirements had on the finished product. Mr. Bejmuk pointed out the importance of strictly defined design requirements and the pitfalls of a performance-oriented design. He used the Sea Launch system as a contrast, pointing out its robust design and low operational cost.

The Space Shuttle was designed to be a high-performance, multi-function launch platform. In function, it has fulfilled that goal; it is an engineering marvel, a "magnificent flying system." However, the cost of a multi-function system is complexity. In order to support the Shuttle, ground operations became far more complicated than originally expected. Other problems included a reliance on operational processes rather than robust design from the ground up. Of particular interest was the process of launch planning. NASA had to refine its process for ascent trajectory calculation over 10 years of Shuttle operations, which led to increased cost. Finally, NASA implemented the Day-of-Launch I-Load Update (DOLILU), which updates the Shuttle's ascent trajectory based on weather data obtained on the day of the launch.

The Zenit Sea Launch platform is a cargo launch system using the Ukrainian Zenit rocket, a robust and proven system, and a launch platform made from a semi-submersible drilling platform. The system combines many existing technologies with new elements to create a simple but effective launch system. The Sea Launch was brought into a fully operational state in less than three and a half years from conception. The Zenit is highly automated, and the two-stage Zenit Sea Launch system is capable of rolling out and launching in 90 minutes using a crew of about 300. The low operational cost of the system results partly from the original strict design requirements of the Zenit rocket. In contrast, however, the three-stage Zenit system requires three days from rollout to launch. This is because the third stage rocket is older, and it was not subject to the same strict design requirements as the newer Zenit.

One of the major problems with the Space Shuttle was its indefinite design criteria and the focus on performance rather then operational requirements. The companies that designed the Shuttle were responsible only for producing a powerful launch system; they were not responsible for keeping the system's operational costs below a specified level. There were no incentives for contractors based on future operations. This resulted in a very labor-intensive vehicle that did its job but at a high continuing cost. In order to avoid problems like this in the future, Mr. Bejmuk stressed, there must be a clear operational concept defined for the launch system. Operational requirements must be enforced among the designers, and there must be clear and constant communication between the development team and the operations team that will be responsible for the system. If these guidelines are kept in mind throughout the design and development of the launch system, NASA should avoid creating a launch vehicle with unexpected operational costs.

NASA Student

Challenge 2007

Effective Teamwork: The EVA NBL Experience

Speaker Lori Crocker
Written by Hannah Lange

Effective teamwork is a critical element of NASA programs. It is especially vital for the Neutral Buoyancy Lab (NBL), which trains astronauts for Extravehicular Activities (EVAs) performed while in spacesuits. Astronauts' lives depend on having safe and viable EVA Mobility Units (EMUs), as an EMU contains air and maintains the environment while an astronaut performs activities out in space. Lori Crocker, EVA Processing Hardware Manager at Johnson Space Center, spoke on this topic at NASA PM Challenge 2007.

In 2001, the NBL EMU lab (also called the "suit lab"), which repairs, assembles, and tests all the EMUs used in NBL runs, moved from an off-site location to its present location at the NBL. This made it more efficient to provide the suits and to work issues for the NBL runs by eliminating travel between the NBL and the off-site location. However, after the move, EMU hardware problems started occurring (minor problems, not safety issues). Outside customers began losing confidence in the product, and morale deteriorated. Therefore, NASA decided to shut down the EMU lab temporarily so corrective actions could be implemented. These actions included increasing the amount of detail in procedures, retraining employees (for instance, making sure to actually complete a step before checking it off the list), and adding more surveillance (quality inspectors from outside the EMU lab).

However, the problems continued, teamwork broke down, productivity decreased significantly due to excessive paperwork and increased apathy, and morale plummeted even further. To resolve these issues, NASA appointed representative Lori Crocker, EVA processing hardware manager, along with an operations manager, to integrate the organization with the external customers. These two individuals worked with the contractor as a TEAM to address the issues, and together they learned valuable lessons on how to turn around a struggling organization.

The first step was to find out what was actually wrong, without assuming anything and without relying on secondhand information. It was extremely important to obtain feedback from ALL levels, including employees (for instance, they realized in retrospect it was not a good idea to bring in outside contractors to perform quality inspections as this caused suspicion and low morale). Once Ms. Crocker obtained feedback, she found she had collected more than 400 issues! She then divided all of the issues into six major categories: morale, inventory, workflow, external interfaces, workforce, and communication. She communicated these specific issues to management, and solutions were found by letting employees help with the fixes.

Another valuable lesson learned was to recognize the importance of employee morale. Management reevaluated the skills of the lab workers, then created promotions and higher-level positions for tenured employees. They found that HOPE is a powerful motivator, and that morale improved when both NASA management and the contractor got involved by listening to and working with the employees (that is, if the working troops are not part of the solution, they will not comply or "buy in" to the fix by management). Communication is the key, because although management previously considered implementing suggestions by the employees, managers had not communicated that fact to the workers, so the workers were feeling ignored and thought no one cared. Openness and listening to employees without retribution by top management led to actual solutions and fixes.

To improve employee morale, Ms. Crocker's team formulated three strategies applicable to any project or program:

1) Plan to maintain morale during the operational phase. This step should be planned and implemented in the earliest phase of the project!
2) Constantly evaluate employee morale. Show appreciation constantly, publicly, and concretely, even in small ways.
3) It is less expensive to maintain morale than to address it later and have to fix the resulting problems.

The team also discovered specific steps to increase TEAMWORK. On the management side, a good way to start is by making it personal. For instance, “I need you to help me fix this problem.” Make the issue clear. For example, “If the contractor fails, NASA fails—I know you want to find a solution to the issue and help with the fix, so what are your suggestions?” Respect the rights of the employees—respect their authority and realize that they are valuable. Get the resources needed to fix the problem and make sure that the contractor, management, and employees all understand and are part of the “fix.” Accordingly, on the contractor side, it is important to be open and honest about the issues that are identified and how you think they should be fixed—do not attempt to put a “spin” on the problems or put the best foot forward as this may cloud the issue and prevent actual solutions. Remember that EVERYONE wants a solution, so trust each other and work together.

What happened to the NBL EMU lab? Did the steps that were taken fix the problems?

The answer is a resounding “YES!” Communication reopened between management and the workers, as well as between NASA and the contractors. Philosophy changes were implemented across the department and morale increased. Ms. Crocker happily reports that there were zero defects and issues with the EMUs since March 2006. The NBL EMU experience proves that effective teamwork can be achieved to accomplish mission success.

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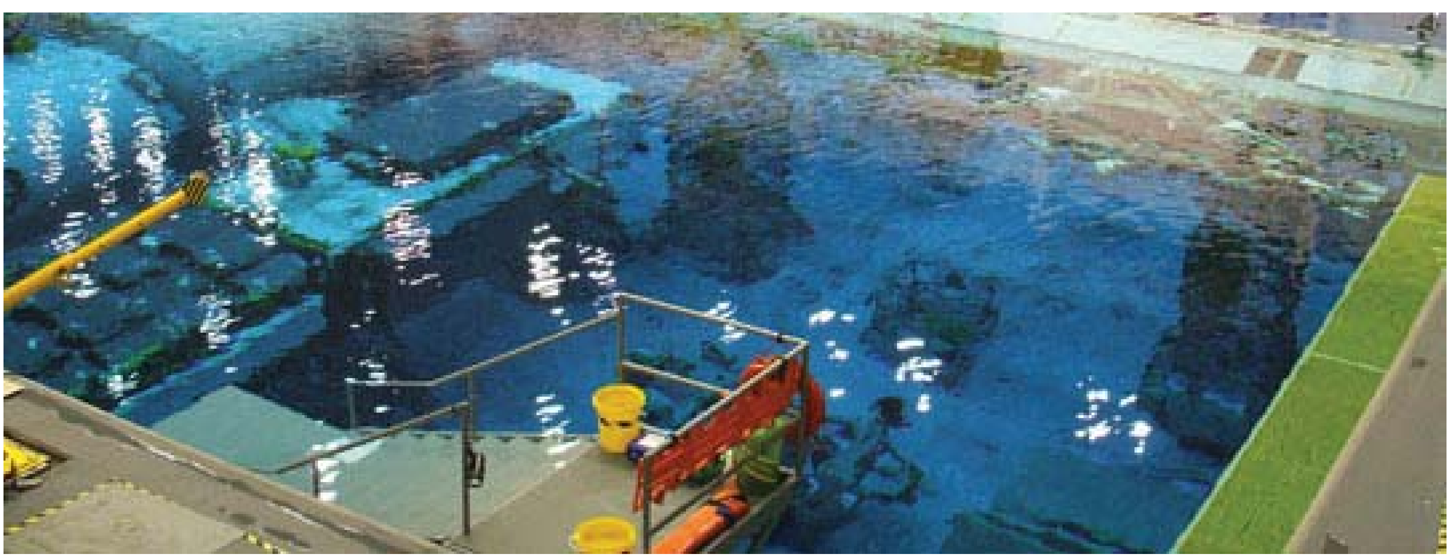


Gravity Probe B: Lessons from a Management Study

Speakers Brad Jones and Ned Clader
Written by Megan Oldag

In 1905, Einstein introduced the famous formula "$E=MC^2$," and 11 years later reconciled the inconsistencies between his theory of special relativity and Newton's theory of gravity. Einstein replaced the force in Newton's theory with curved space-time and related gravity to mass. The theory of general relativity was incompatible with quantum mechanics, and although Einstein died trying to resolve these discrepancies, there still remained a plethora of unanswered questions. In 1965, NASA recruited Dr. Francis Everett as Principal Investigator (PI) to test the theory of general relativity. The result of this 40-year quest was the Gravity Probe B (GP-B) mission. Gyros are mounted on a spin axis and pointed toward a stationary star. If the gyros move from the guide star, then the theory will be proven correct. In their presentation at, NASA PM Challenge 2007, "Gravity Probe B: Lessons from a Management Study," Brad Jones from NASA Johnson Space Center and Ned Calder from the Massachusetts Institute of Technology explained how this program proved to be the "perfect management case study."

After seven failed attempts to get funding for the program, in 1985 Congress finally granted a substantial amount to GP-B. The program could move forward and begin more research and experimentation. Relativity, however, was not the only thing this program was investigating. According to Mr. Calder, then-NASA Administrator James Beggs pointed out an additional experiment, in a conversation between Mr. Beggs and Dr. Everett. Mr. Beggs stated that the "GP-B will be an interesting management experiment in addition to an interesting science experiment." GP-B was one of the first programs implemented using a university rather than industry as the prime contractor. The management team in this case consisted of Stanford University, Lockheed Martin as the industry partner, and NASA. Mr. Beggs's statement proved correct, as the management team was faced with various problems throughout the project's life span. Most of these problems stemmed from what became known as "organizational asymmetries" in the organizational approach of Stanford University and that of NASA and Lockheed Martin that were discovered toward the end of the project by researchers looking at the partners' organizational approach.

As the research team looked at the assymetrical organizational styles of the partners, it realized that these asymmetries fell into three categories: the environment, the culture, and the areas in which each partner was strongest or most capable. At Stanford, there were no assigned positions or hierarchy; everyone worked together as equals, and learning was the main priority rather than production. NASA and Lockheed Martin both had hierarchical structures with everyone assigned to different tasks. They were also both cost conscious and mission-oriented. Individuals at Stanford stated that "Lockheed Martin is only out to make a profit," while NASA Marshall Space Flight Center (MSFC) said that "it was extremely difficult to get the university personnel to stop tinkering and start producing." Stanford did not understand why Lockheed Martin and NASA operated the way they did and vice versa. This lack of understanding created relationship problems within the management team. The team needed to find a way to break the communication barriers that were inhibiting a dynamic environment. This was accomplished by temporarily transferring university team members to Lockheed Martin and Lockheed Martin team members to the university. The exchanged team members spent time at their new locations learning the culture and how individuals interacted. The greatest benefit, however, was learning how and why the different parties operated the way that they did. In doing this, these exchanged team members became a "boundary agent," or "medium," and a crucial asset to effective communication among all the parties. When Stanford said or did something that Lockheed Martin did not understand or the reverse happened, team members could call upon the person working with the other partner. Usually, the message that was understood was not the message that was trying to be conveyed. With the help of the boundary agents on both sides, effective communication was achieved.

The life span of any project consists of five major phases. The preliminary analysis, the definition, and its design are the first three. In these stages, the team is working on the "conceptual definition, technology development, and specification development and innovation," to be led by a "PI or Project Manager [PM] with a strong science technology background." The university's expertise exceeded that of Lockheed Martin during these first three phases. Problems began to arise upon approach of the "contextual transition," the period when the project moves from conceptual, technology, and specification development to the last two project phases—development and operations, which require greater aerospace skills. Mr. Jones explained that the university, overall, was not very knowledgeable about aerospace skills. It might have some background in the field, but as Mr. Calder put it, “aerospace skills are like driving a car. Just because a student completes a driving course does not make him a safe driver. It takes about four to eight months of driving to really be comfortable behind the wheel.” GP-B had a management team of inexperienced drivers approaching a crucial turning point in the project.

When a project moves into the last two phases, development and operations, a “PM with a strong aerospace management background” needs to take the lead. About a quarter of the way into the development phase, focus needs to switch from science and technology to development. Initially, the appropriate change in PMs should be from science-led management to aerospace-led management. The PM selected for this transitional phase on GP-B had a strong background in science as well as in aerospace. However, this person was only able to stay on the project for a short time, and the team needed to replace its PM. Rather than finding a PM with a strong aerospace background, it decided that a scientist manage the development phase. During the development phase, the team should be working on hardware development, integration, and running tests on the GP-B. It is imperative that during this time there is a PM with a strong aerospace background. The decision to have a scientist-led team was not well received by the collaborating company. Lockheed Martin’s opinion was that “there seemed to be a substantial period of time where Stanford’s management did not know how to complete a space program.”

The university was not fully aware of the need to change its management to match the direction of the project and, thus, impeded the project’s completion. At this point, NASA intervened and mandated that the team be led by a PM with an aerospace management background. Mr. Jones stated how “NASA had very little interaction with the project” before this intervention. After NASA became involved, aerospace training was implemented for the university team, and their skills were fine-tuned, becoming competitive with “any contractor at utilizing aerospace processes,” as stated by NASA MFSC. NASA employees use their aerospace skills every day, but the university team members do not. Mr. Calder suggested that “NASA needs to conduct early training sessions…. for university employees to aid in an efficient transition.” Mr. Jones added that NASA needs to “implement a risk management system to aid management.” By the end of the project, all parties had overcome communication obstacles, and the university members had the aerospace skills needed to complete a space program.

The problems encountered during the GP-B management experiment can create a blueprint for future collaborations. The majority of the problems resulted from a lack of understanding, miscommunication, and a lack of awareness. The solutions to these problems lie with preemptive action. I cannot comment on the scientific benefits of Gravity Probe-B because, when asked, Mr. Jones would not disclose that information because the findings had not yet been released officially. I can, however, comment on the benefits of the management study. The management study of the GP-B program demonstrates that its results can be generalized to any situation where the collaborating parties have organizational asymmetries and to any project with a contextual transition. An example of this, as stated by Mr. Jones, is “center-to-center collaborations.” He explained how a team at Johnson Space Center and a team at Marshall Space Flight Center may have different ways of operating. By following the example of the GP-B project, the two centers could exchange team members and create “boundary agents” to aid in communication. The downfalls of the GP-B program can now be used as guidelines to strengthen future collaborative projects.

The Need Not to Know

Speaker William Gerstenmaier
Written by Sarah Percy Janes, PhD

At an afternoon assembly at the PM Challenge 2007, William Gerstenmaier, Associate Administrator for Space Operations, spoke on the topic of communication —The Need Not to Know. He included body language as well as data, cell phones, and email in his presentation.

The presentation began with a brief video clip of President George Bush walking to the podium with Vice President Chaney walking behind him. As the President began his speech, Vice President Chaney takes his Blackberry out of his pocket and proceeds to work with it while the President is speaking. Mr. Gerstenmaier asked the audience what message was actually being sent. Many replied that, based on Chaney's attention to his Blackberry, the message President Bush was trying to send was not very important. While this is not the message the Vice President wanted to send, it could certainly have been perceived that way. What message do we send when we answer our cell phones when in conversation with others? What message do we want to send? The words "constant partial attention" may be what everyone gives in our technological society. Steven Levy stated in the March 26, 2006 edition of Newsweek, "A live Blackberry or even a switched-on mobile phone is an admission that your commitment to your current activity…is fickle."

There are more than 150 databases in all of NASA. Many of these contain overlapping information that can be consolidated into fewer databases. There is so much data that one may be enveloped by data and may not be able to use it or even control it. When data becomes overwhelming, we often become less strategic and more tactile with it. In other words, we end up moving the data around rather than using it to achieve a goal. There is also a tendency to become more reactive and less reflective with the data at hand. Albert Einstein once said that "information is not knowledge." Mr. Gerstenmaier asked, "If information wants to be free…at what point does it incur a cost?"

Google provides what seems to be an endless amount of information. With approximately 2,000,000 distinct web pages at the nasa.gov domain, it can be determined that there are about 32 web pages for each civil servant and contractor at NASA. Common sense and good judgment are often needed to use the information in a manner that provides the opportunity to gain knowledge.

The growing use of technology provides opportunities for gaining more information, faster, easier and without paper. However, it is necessary for one to step back and contemplate whether the technology is actually causing greater efficiency and/or effectiveness. Just because one has a cell phone, does one need to use it more than he or she used a phone before? Are cell phones always used for efficiency or does their use often cause a distraction and a lack of focus on the importance of what is at hand?

How many emails do you get each day that have no relevance? How many emails are just pass-alongs ? How many emails are not read and simply deleted? Do we use email in a manner that is effective and results in efficiency? Mr. Gerstenmaier suggests that we always consider carefully to whom we are sending an email, what we are sending, when we are sending it, and why we are sending it. We need to take time to think, not react.

The presentation closed with a quote from Winston Churchill referring to the gathering and sending of information: "True genius resides in the capacity for evaluation of uncertain hazardous and conflicting information."

Case Study: The Long Road to GOES-N Launch

Speaker Ken Yienger and Ed Rogers
Written by Reese Kimmons

NASA's PM Challenge case study discussions could be compared to a meeting of Monday morning quarterbacks, except that football isn't rocket science. As you enter the room, you are given a scenario to read. In this case, it is the story of 14 months of design, processing, and technical delays and challenges associated with the final launch activities of the GOES-N weather satellite. And they weren't just technical problems. Throw in several hurricanes, striking contract workers, and steep penalties that would have to be paid if NASA said "Stop" to launch processing, and you begin to understand the various dynamics involved in getting a mission off the ground.

Case study participants are given a few minutes to look over a scenario, then they are asked what they would have done about each of the problems had they been in charge. These are real-world scenarios, and the people who actually made the decisions hosted the case study discussions. Ken Yienger, mission system engineer and the systems manager for the GOES N-Project, and Dr. Edward Rogers, chief knowledge management officer for Goddard Space Flight Center, hosted the presentation.

Imagine you are the GOES-N project manager. You have a satellite that would cost $500 million to replace if anything went wrong. Your mission was originally scheduled to launch in the spring of 2005, and it is now late December 2005. There are issues relating to your flight batteries, the ground storage life of observatory hardware components, and the inability to run a complete test on your equipment because it is sitting atop a launch vehicle. If you are concerned enough to say "Stop," NASA will incur contractual penalties of up to $250,000 per day. De-stacking and removing the satellite from the launch vehicle is the only way you can fully test the systems, but then it would take at least 25 days to return to flight readiness. A strike by launch vehicle technicians further complicates matters. These are a few of the issues that presented themselves during the GOES-N launch campaign.

Despite the problems, all ends well. As is often the case, the creativity of NASA and Boeing engineers resulted in new answers—the development of a series of new test procedures used to check components and systems in the GOES-N satellite while it was stacked and on the launch pad. On May 24, 2006, after almost 11 months on the pad, the GOES-N observatory was successfully launched. Just like the "film studies" help the NFL quarterbacks prepare for game day, case study discussions such as this one bring out new ideas and help prepare NASA project managers to make difficult decisions in stressful situations.

Communication: The Key to Knowledge Sharing

Speaker Bryan O'Connor
Written by Reese Kimmons

An anonymous Marine infantry officer once said, "Communication is too important to be left to the communicators." Brain O'Connor, the Chief Safety Officer from NASA Headquarters, discussed communications at NASA PM Challenge 2007. As Bryan O'Connor pointed out, NASA obviously has all the best high-tech tools needed to effectively and instantly share information. His question was whether the right information is being shared—information that would prevent another serious mishap.

It has only been within the last 10 years that longstanding communications barriers have been dropped, allowing pilots from competing passenger airlines to share information about close calls and near misses. The U.S. Department of Veteran Affairs hospital system has since adopted a voluntary error reporting system patterned after the system now used by the airlines. According to Mr. O'Connor, NASA wasn't doing a great job of reporting close calls 10 years ago either. That has changed.

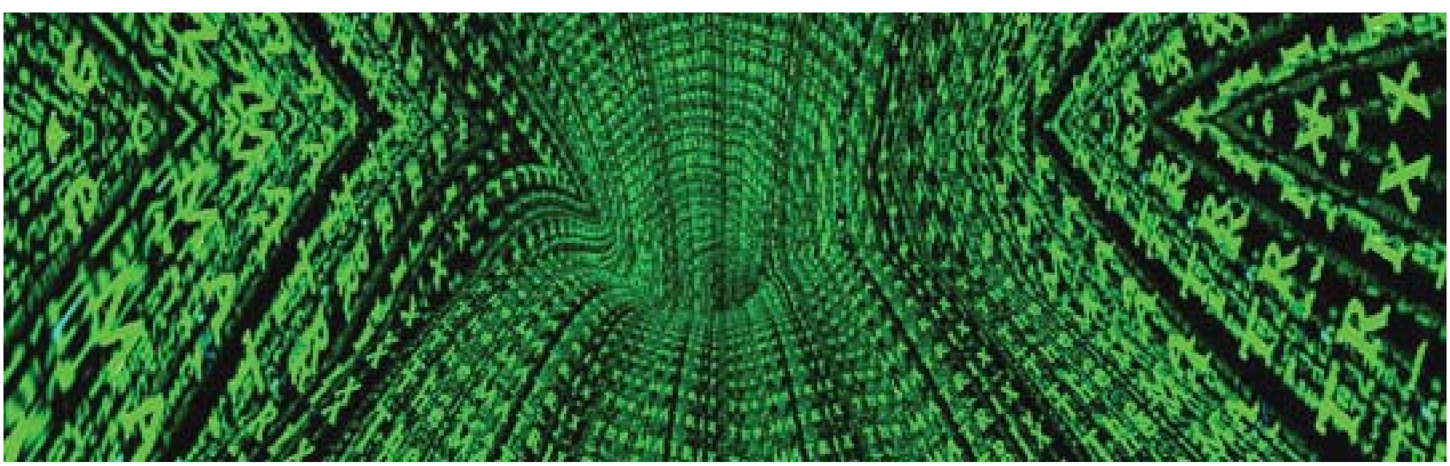
Originally established in 1975 through an agreement between NASA and the Federal Aviation Administration, the Aviation Safety Reporting System (ASRS) allows for anonymous reporting of safety issues. NASA, in the late 1980s, after the Challenger accident, established the NASA Safety Reporting System (NSRS), patterned after the ASRS. Mr. O'Connor encourages the reporting of safety concerns by NASA personnel although he stressed that the NSRS is a communications system of "last resort" and should only be used when all other methods of communicating a safety issue have been exhausted. Currently, the number of reports made to the NSRS is up around 660.

To handle their technical issues effectively, NASA project managers must have the ability to evaluate the risk factors involved and budget their time accordingly. Spending too much time on low-risk items would cause operations to grind to a halt. Mr. O'Connor quoted Joseph Juran, saying that the ability to "separate the vital few from the essential many" is a necessary skill in risk management and should be considered by all when communicating technical information to their managers.*

Mr. O'Connor stressed that effective communication includes having clear rules as well as insight into the rationale behind them. He credits former astronaut and NASA Administrator Dick Truly, when responding to the 1987 AC-67 launch failure, with the idea of including along with written rules, an explanation of the reasoning that led to their creation. Knowing the rationale behind a rule helps decision makers understand how and why a rule applies to the situation at hand.

To emphasize the importance of communication in high-risk ventures, Mr. O'Connor reminded his audience that the Marines pictured raising the flag in the famous photograph from Iwo Jima were actually in the process of stringing a telephone line—raising the flag had not been their primary mission.

* Joseph Juran is conidered the "Father of quality" by many.



Panel: Better Baseline Management

Written by Chris Garza

When I think of a baseline, I think of it as a starting standard for future comparison. Usually we use a baseline in information technology to measure network speed and how quickly information can travel through the network. We use baselines on computers to measure how efficiently a computer executes commands and how efficiently it uses system resources currently compared to when it was new. We even use a baseline in sports fitness to measure our improvement or regression in strength, speed, and endurance. Better baseline management can produce more desirable results no matter what goals we are trying to achieve. Better baseline management incorporates techniques that are used to produce an accurate overall plan for a project.

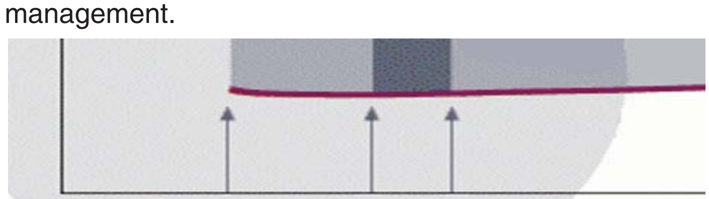
"Better Baseline Management" was a panel discussion at the NASA Project Management Challenge 2007 at Moody Gardens in Galveston, Texas. In this session, panelist Gilberto Colon, NASA Goddard Space Flight Center, Ivy Hooks, President and Chief Executive Officer of Compliance Automation Company, Bill Palmer of Lockheed Martin Space Systems Program, and Bobby Watkins, NASA Johnson Space Center, spoke about project management. Kenneth Poole, NASA Marshall Space Flight Center, moderated the session, asking a series of questions that allowed the panelist to answer and elaborate about better baseline management. Mr. Poole started the session by introducing himself, and clarifying any confusion about Project Baseline by defining it as "a formally approved plan that projects use to manage by, and maybe even measure themselves by." Poole went on to say that "NASA is undergoing a major transition right now, trying to put more emphasis on up-front planning, improving that, and performance accountability." Poole introduced the panelists and opened up the session with questions for the panelists.

Mr. Poole asked Mr. Watkins, "What does it mean to you to establish a good project baseline and how important is it?" Mr. Watkins responded by saying, "I think from a criticality prospect on this, it's very critical to show a baseline before you start any project. I like to think of it as more of a closed-loop process. When you start talking about project management and how you pull those particular things together, of course, you have to have a good set of technical requirements. You've got to understand those requirements. You've got to understand the scope of those requirements as you drill down that particular piece of it. The next things you want to do are look at the cost and understand the cost aspects as well as the schedule. I think with that particular foundation in those three different areas, you have a pretty good chance of understanding the overall project. Understand the cost, the schedule, and your overall technical requirements. Also I think it's important … that as you drill down, you start working your Work Breakdown Structure (WBS); getting down to the lower pieces of that particular project. As you do that, you start assigning who is responsible for this particular part of the project, so that you don't have any accidents or slip-ups or people not being responsible. You want to hold your people accountable; at the same time, set the criteria in which you want them to go off and do. Hold them accountable, but set your criteria, and let them go do the work for you....."

Mr. Palmer added, "There is another important facet of a baseline that I think that we sometimes seem to forget about….A baseline helps you communicate across a team, particularly a widely dispersed team about what is it they have to do, how or what they do to interface with other parts of the system. Engineers often think of establishing a baseline as kind of a bad thing, but there are a lot of good things about establishing a baseline and communications is one of those solid good things about having a good baseline."

Mr. Poole continued talking about a question that usually comes up in the early stages of planning a baseline: "How much reserve do you plan into the baseline?" Mr. Colon responded: "I think there is a very fine line between trying to decide how much reserve should be held for schedule and cost and costing you out of the competition, meaning canceling yourself because you are too expensive, and no one can afford you. Every project manager and every team walks that line.

In retrospect, we can always use a better baseline. Using some of the techniques recommended by our speakers can help us reach that goal in respect to project management.



Managing Priorites in a Complex Environment

Speaker Frederick Manzer
Written by Hannah Lange

In a world where modern technology provides constant interruptions, determining priorities—and then actually completing them—is hard!

It is Frederick Manzer's business to advise others on how to work more effectively and productively by teaching organizational techniques and time management skills. In that capacity, Mr. Manzer asked the audience at NASA PM Challenge 2007, "What do you do when the phone rings? Do you answer it? Ignore it? Turn it off? Who does it have to be for you to choose to answer it? Your wife or husband? Boss? Customer? Administrator? President? How do you choose who you need to speak to immediately?"

The bottom line is if you do not make choices, you will not solve problems. Priorities involve making a lot of choices each day, sometimes difficult ones that may cause others to be unhappy. Our priorities are often decided for us by bosses, clients, family, or circumstances all demanding immediate attention. We need to take control back by making appropriate decisions and saying "no" to the interruptions.

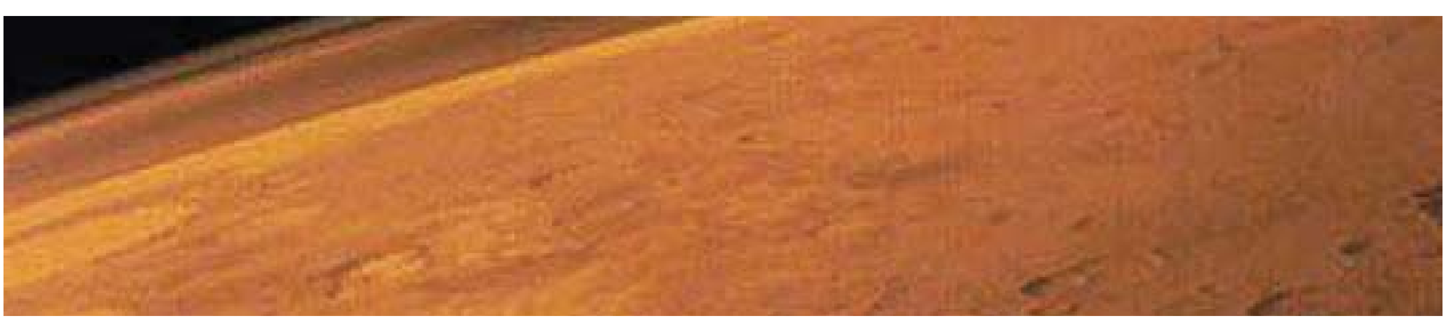
Typical ways to set priorities include multitasking, swapping tasks, worrying, doing the most urgent task first, some combination of these options, or all of them. However, many of these options are ineffective and lead to frustration rather than success. For example, multitasking is a myth, says Mr. Manzer. Just as a computer must stop one task to perform another, we are similarly structured: we must literally stop working on one task to do another. This decreases effectiveness because, in terms of cognition, the brain takes 10 to 15 minutes to "switch gears" and follow the neuron pathway in a new direction. Likewise, worrying does not achieve anything except to rob us of precious energy and divert focus from the task at hand.

There are solutions using proven techniques. First, determine the importance and urgency of tasks by asking relevant questions and using simple tests, for example, "Will it matter in 100 years?" or "Will my wife divorce me if I don't attend the family dinner?" Always start with what is most important, making an actual PLAN to get it done by listing tasks in order of priority and budgeting time to accomplish them. Unless interruptions are the job (for instance, customer support, nurse, mother)—in which case one should give full attention to the task or person at hand—prevent interruptions by using various techniques such as using mornings to accomplish the most urgent task or returning phone calls and e-mails only after lunch.

I personally found other suggestions extremely helpful. For instance, I can:

• Communicate my process to my boss and co-workers so they support me and my plans do not backfire.
• Constantly seek alternative solutions (ask for help, be realistic with my timeline).
• Fight procrastination by doing the most unpleasant task first or committing to work for only five minutes at a time and then committing to another five minutes until the task is done.

In conclusion, we have to remember that we are in control and already making choices every day—however, we can learn how to make better decisions by using effective techniques so that we may be more successful. And who doesn't want that, in both work and personal life?



Mapping a Path to the Solar System and Beyond

Speaker Franklin Chang Diaz
Written by Jennifer Trejo

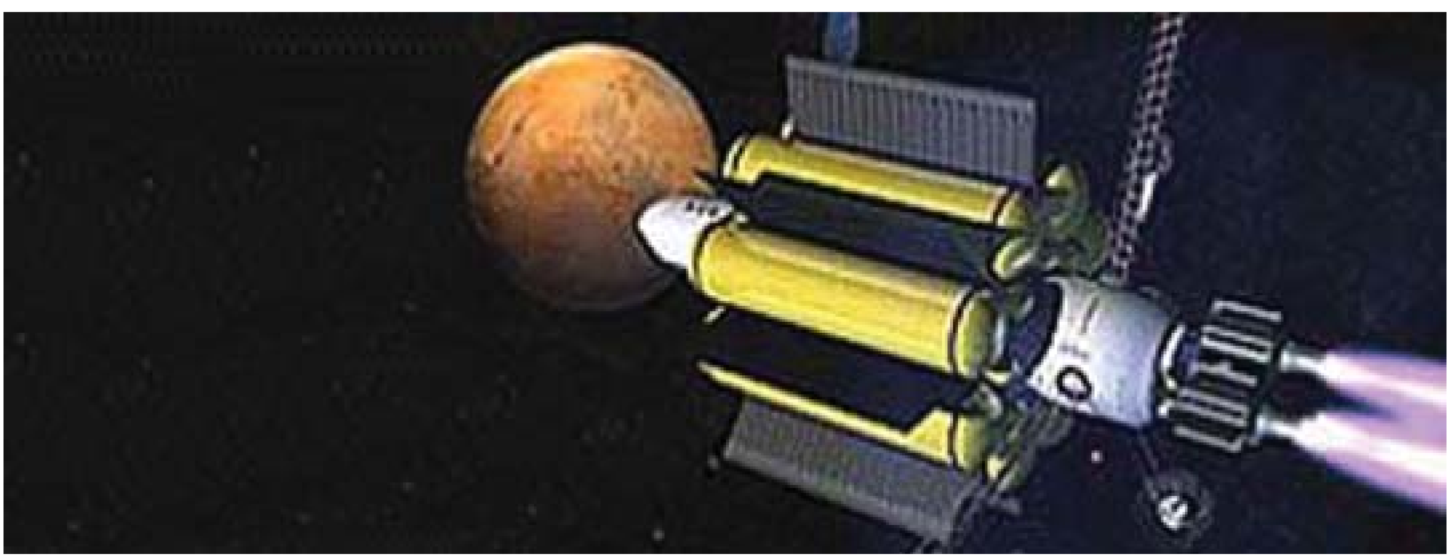
Our current chemical rockets have been sufficient to get us to the Moon and back. For future trips beyond the Moon, there is a need for a more powerful rocket. Currently, Dr. Franklin Chang Diaz and his company, Ad Astra Rocket Company, are working to develop a type of plasma rocket that may be powerful enough to get us elsewhere in the galaxy.

We are sending probes and other kinds of uncrewed spacecraft to the surface of Mars to take pictures and gather data about the planet. The next logical step is a human mission to Mars. The Moon is always the same distance from the Earth. The distance from the Earth to Mars is not constant and therein is a serious problem when considering a crewed mission to Mars. In addition to Mars, we wish to be able to travel to other interesting places within our galaxy.

One of the main purposes of a plasma rocket is to get people to these distant places quickly. The engines on these new plasma rockets would still be positioned on the back of the rocket and would eject ionized plasma. Hydrogen seems to be the chemical of choice for these rockets, according to Dr. Diaz. It could be used as a fuel, a coolant for the rocket, and as a shield from the radiation in space.

The plasma used to power these rockets is formed by running a gas through a super conductive magnetic field. The plasma is then shot out of the back of the rocket and used for propulsion. The first prototype rocket will be fired and tested at the end of 2007. Since the plasma rockets use less fuel than chemical rockets, the price for launching the plasma rockets is much less.

The plasma rocket is still just an experimental rocket, but the technology is moving forward at a very fast pace. Sometime in the near future, Ad Astra Rocket Company and Dr. Franklin Chang Diaz hope to be able to bring these rockets out of the theoretical and experimental stages and into the production and employment stage.



Seven Key Principles to Program and Project Success

Speaker Vincent J. Bilardo, Jr.
Written by Hannah Lange

In late fall of 2002, the Columbia Accident Investigation Board (CAIB)reported that causes for the loss of Space Shuttle Columbia included schedule pressures, compromises to gain approval, and the fact that "[detrimental] cultural traits and organizational practices were allowed to develop." With the CAIB report's conclusions as a main motivator, an Organization Design Team (ODT) was formed to analyze NASA's "human systems"—program and project organizations—with the same rigor as it looked at its flight and ground mission systems.

The ODT had four goals: to discover lessons learned via invited lectures from technical and academic fields, to identify tools and methods used in successful programs, to apply these methods in pilot studies, and to develop the previous steps into a "toolkit" to adopt the best practices across NASA.

NASA recruited individuals from its various centers as well as contractors participating in the Next Generation Launch Technology Program to serve on the ODT. Invited lecturers ranged from individuals in the technological and academic fields to those in systems engineering. They focused on key elements of successful projects such as the Apollo and Saturn programs, the Have Blue and F-117A Stealth Fighter, the X-38, and the Virginia Class nuclear submarine as well as on lessons learned from weak ones such as the X-33 program and the Space Shuttle Challenger and Columbia accidents.

From these lectures, seven key principles of program success emerged. These principles were the focus of this presentation by Vincent J. Bilardo, Jr., Ares I-1 Upper Stage Simulator Element Manager of the Launch Vehicles Project Office at NASA's Glenn Research Center.

The first key for starting any successful program is to have a clear and compelling vision. For example, President John F. Kennedy captured the world with his stirring speech initiating the Apollo program, allowing the United States to focus on the goal of reaching and returning from the Moon within the decade. On the other hand, the 1987-1991 Space Exploration Initiatives lacked a clear and compelling vision and, as a result, the program faltered while NASA morale and public opinion took a nosedive.

The next two principles, based on the first, are to secure sustained support from "the top" and exercise strong leadership and management. Top leaders need to establish mission goals and clearly communicate their vision of the future to the public and employees. Organizational leaders can then develop a practical plan to implement them. Leaders must put techniques in place to obtain finances and support from Congress and the White House as well as to maintain and protect the program. Identifying and developing strong project leaders with clearly defined authority and accountability was stressed by Mr. Bilardo. Leaders have to demonstrate uncompromising ethics and high integrity, follow-through and honesty because these qualities build respect and team commitment.

The most important principle of all is to facilitate wide-open communication. Senior leaders must foster open and honest communication without retribution regardless of whether the news is good or bad. There has to be an "open-door" policy to encourage upward communication as well as an emphasis on person-to-person contact (NOT e-mail or phone calls). It is vital for leaders to praise employees in public and criticize in private.

Another key principle is to develop a strong organization. This can be achieved by aligning the three pillars of an organization—culture, rewards, and structure. Rewarding desired behavior and good performance (sometimes outside of normal policy!) is necessary to building and sustaining morale. Small teams should be located in the same facility whenever possible, and off-site team "fun" events with both leaders and employees are to be encouraged. Clearly define and document responsibilities on both sides of the interface and use analytical tools and techniques for accountability (for instance, daily reports).

Managing risk is essential to ensuring a successful project. The first step is to investigate and organize relevant historical data, then to construct realistic models using that information. Update the models with new information as the simulation is tested, making sure to identify and track trouble spots as they emerge.

The last principle is to implement effective systems engineering and integration. This can be achieved by developing clear and stable objectives at the beginning of the project and limiting top-level program requirements to only ONE PAGE. Develop a consensus around the objectives with input from employees, contractors, and all those involved in the project. Design state-of-the-art automated tracking of requirements as the project progresses using electronic visualization and engineering analysis to simulate system behavior. Finally, establish simple and clearly identified interfaces between systems and personnel, providing instant access for all team members.

If these seven key principles are followed and implemented, program success can be achieved, as proven by many successful projects such as the Apollo and Saturn programs. Accordingly, critical errors can be avoided by learning valuable lessons from the past.

Project Quality Assurance

Speaker Brian Hughitt
Written by J.B. Groves III

What do you think of when someone asks you about quality or whether something is a quality product? How does NASA maintain quality assurance in all of the projects that are being started, are ongoing, or are being retired? What is the difference between non-conformance and conformance?

Many of these questions were answered during the session "Project Quality Assurance" given during the NASA Project Management Challenge 2007 by Brian Hughitt, manager of Quality Assurance, NASA Office of Safety and Mission Assurance.

The session started with a very powerful video from Pratt & Whitney Rocketdyne about the Columbia mishap. It set the tone for a discussion of why quality assurance is so very important.

The NASA Quality Roadmap addresses three distinct areas for compliance within the discipline of quality assurance: Technical Requirements, Safety Requirements, and Quality Requirements (see Figure 1).

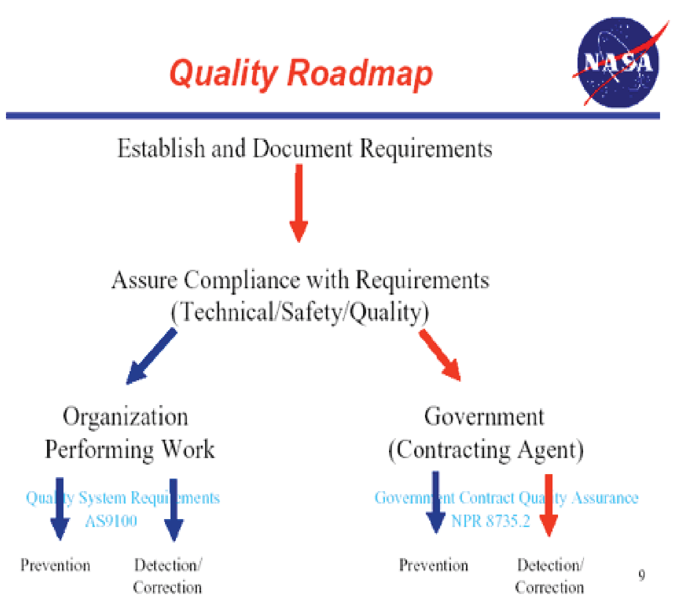


Figure 1. Quality Roadmap

The roadmap further illustrates the two different types of organizations responsible for assuring quality—the organization that performs the work (normally a contractor from the private sector) and the organization that issues contracts for performance of the work (often the government). Both of these functions are mandatory. The requirements are stated in the Federal Acquisition Regulations (FAR), Part 46, Quality Assurance.

Contract quality requirements: Requirements in the contract relating to the quality of the product and those clauses prescribing inspection, and other quality control incumbent on the contractor, to assure that the product conforms to the contractual requirements.

Government contract quality assurance: The various functions, including inspection, performed by the Government to determine whether a contractor has fulfilled the contract obligations.

In essence, the government is required to perform "all actions necessary" to verify that the product conforms to contract quality requirements. The extent of quality assurance is based upon the complexity and criticality of the contract item. The types and/or categorizations of the items fall into two areas of risk, and according to NASA Policy Directive (NPD) 8730.5, "NASA Quality Assurance Program Policy," "it is NASA policy to mitigate risks associated with noncompliance."

Deliverables to NASA are reviewed and inspected using various tests and inspections, including Government Mandatory Inspection Points (GMIPs). GMIPs can be broken down into three areas:

• Safety Critical - whereby there could be loss of life, this is the most severe consequence. These inspection points are mandatory and involve 100 percent conformance of product.

• Mission Critical - where loss of mission, serious personal injury, and/or loss of significant resource may have highly severe consequences. These inspection points have a heightened confidence and are sampled.

• Key Requirements - where product and process attributes have moderately severe consequence and likelihood. This involves discretionary assignment of inspection points.

GMIP general requirements include "timing" of the inspections, that is, whether they are early or late in the sampling cycle, normally after contractor acceptance, and only done at subcontractor facilities when necessary.

Government inspectors are required to provide a signed statement indicating understanding that his/her stamp or signature is a professional individual warranty, that they personally examined the product as literally stated, and that a positive (closed loop) accounting method is applied.

NASA has numerous regulations and documents related to quality assurance and monitoring. An all-inclusive Project Quality Assurance Surveillance Plan (PQASP) has recently been promulgated. The elements driving the PQASP are document review, product assurance, quality system evaluation, quality data analysis, nonconformance reporting, corrective/preventive action, and final acceptance.

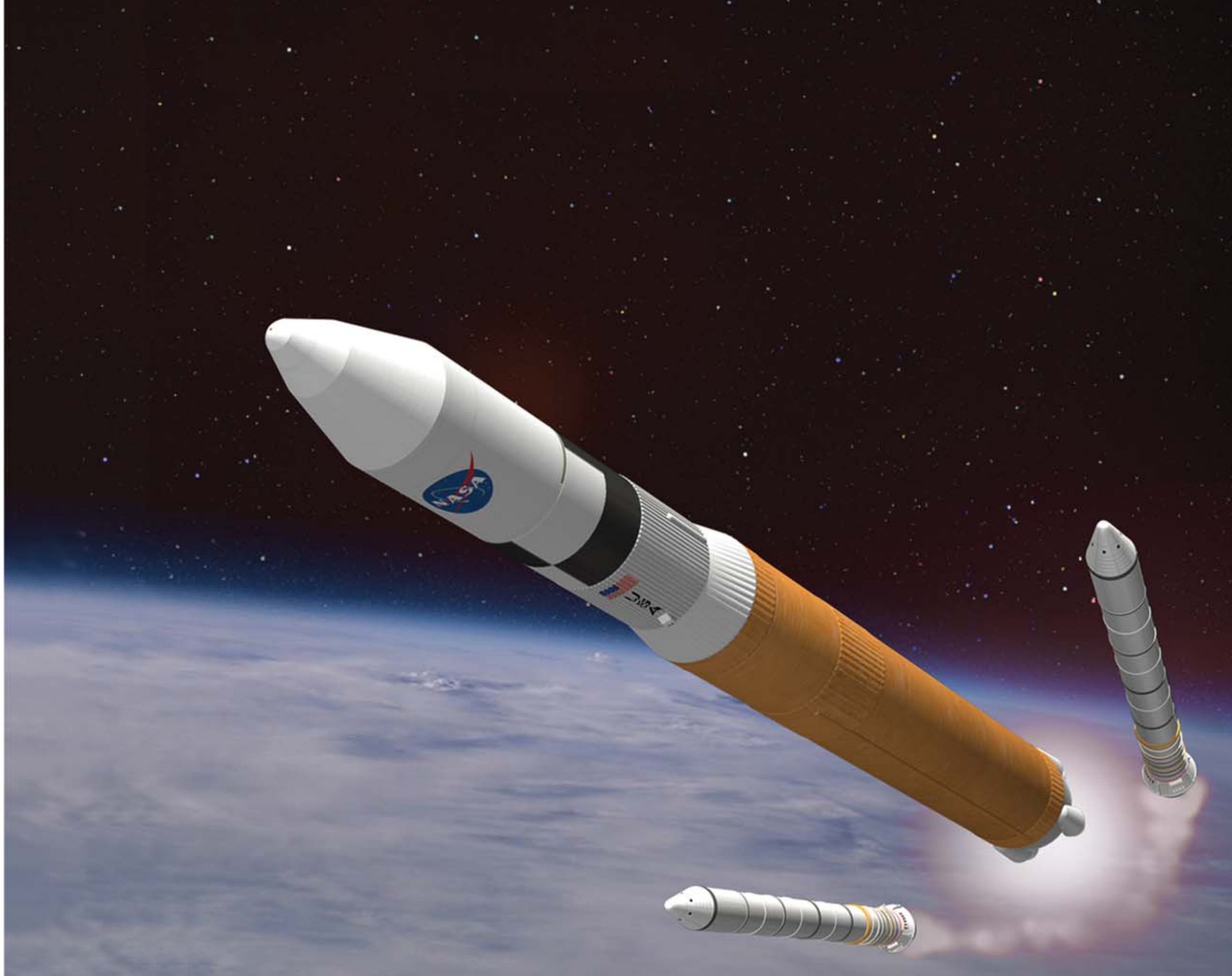
The following benefits would emerge from the plan: a single integrated document consolidating all quality assurance requirements such as those found in the Federal Acquisition Regulations (FAR), the NASA FAR Supplement, NPD 8730.5, and NASA Procedural Requirements (NPR) 8735.2, "Management of Government Quality Assurance Functions for NASA Contracts." The plan could be adjusted based on changing risks and would identify product examinations, processes to be witnessed, records to be reviewed, quality system elements to be audited, GMIPS, and sampling plans.

In summary, NASA performs highly critical and complex activities. The quality system assures that all critical requirements are met. Finally, to quote American scientist and writer William A. Foster, "Quality is never an accident; it is always the result of high intention, sincere effort, intelligent direction, and skillful execution; it represents making the wise choice of many alternatives."

PM CHALLENGE 2008

We hope that you have enjoyed PM Perspectives 2007.

Be sure to check the conference website at: http://pmchallenge.gsfc.nasa.gov for further information about PM Challenge 2008.



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NASA Project Management Challenge 2008

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